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GUN DRILL

FOR

6-inch B.L. Marks VII and VII^v GUNS
on Carriages Garrison C.P., Mark II.
(LAND SERVICE.)
1922.



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By Command of the Army Council,

H. Greedy

THE WAR OFFICE,

August, 1922,

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GENERAL INSTRUCTIONS.

Practical instruction in the equipment should be given to each recruit before any attempt is made to instruct him in gun drill.

In teaching the duties of each man at the gun, the instructor should try to do so by reasoning rather than by a long explanation in words. By means of question and answer he should try to draw from the recruit the correct solution as to his duties, being careful to lead the man's mind into the desired channel of thought. Should this attempt fail, the instructor should give a demonstration emphasizing the points the recruit has not grasped. Such demonstrations should deal with the work of each man in the detachment, and all men under instruction should, in turn, carry out the work of each particular number.

Instruction in gun drill should begin as soon as the men are conversant with all parts of the equipment, and can handle in the best and quickest manner each of the working parts of the gun. Once the work of each number has been thoroughly mastered, it should not take long for a recruit to learn the actual drill.

It is most important that a marked distinction should be drawn between instruction and drill.

During the former the language used should be as simple as possible, and the meaning of all technical terms which are necessary must be carefully explained. A conversational tone should be adopted and under no circumstances whatever should anything in the nature of long quotation from drill

books be allowed. The men should be permitted to assume an easy attitude and their interest should not be allowed to flag. They should be encouraged to ask questions.

At drill, on the contrary, rigid discipline must be maintained, orders must be clear and decisive and the detachments be made to work steadily, smartly and rapidly. At the same time the utmost accuracy is essential and any deviations from the methods laid down must at once be checked.

It is advisable that a portion of the drill should be such as to give instruction in firing at long ranges.

With certain guns the supply of ammunition is the most difficult and laborious part of the service of the guns. This can best be taught by means of the "loading teachers" and the dummy ammunition supplied for the purpose.

CHAPTER I.

GENERAL DUTIES.

1. THE DETACHMENT.

This chapter summarizes the duties of each man in the detachment. It is intended only as a guide to the instructor, who should use his own words in explaining the various duties to the men.

The detachment is composed of thirteen men. The service of the gun is divided between them as follows :

1.	...	...	...	In command and ramming.
2	...	...	...	the breech.
3 and 5	...	...	...	the loading.
4	...	...	...	the ramming.
6 and 8	...	...	...	preparation of cartridges.
7 and 9	...	...	...	preparation of shell.
Auto-Sight-Layer	...			Auto-sight and training arc.
Rocking Bar Layer				Rocking Bar Sight and Elevation indicator.
Setter for Training				Training Dial and Auto-Sight.
Setter for Range	...			Range Dial and Rocking Bar Sight.

2. DUTIES OF 1.

1. He COMMANDS and is entirely responsible for the service of his gun.

2. He gives the WORDS OF COMMAND detailed for him in Chapter III. His orders must be given clearly, but not

louder than is necessary to enable the detachment to hear. Before giving a word of command he must repeat the letter of his section and the number of his gun.

3. He is responsible that his gun is laid on the target ordered. He will direct the gun on to the target by means of the shield sights when Mk. IV shields are provided.

He must be prepared to perform the duties of section commander when necessary.

He is responsible that the bore of his gun is clear, before even drill shell and cartridge are used; this precaution is particularly necessary at night and before firing blank.

When a tube is fired in preparing for action with axially vented guns, he will see that no one is in front of the muzzle, and in all cases he is responsible that no charge is in the gun.

NOTE.—All breech numbers must be warned that when once the motion of closing the breech has commenced, the lever must on no account be partially drawn back to obtain a fresh purchase, as the tube may be partially extracted, and any subsequent forward motion of the lever would bend it. In the case of a percussion tube this might explode the detonating composition and fire the charge prematurely. Also that, whenever the breech is closed without inserting a tube, the extractor should be pressed well home before closing. Under no circumstances should the lock be snapped unless a tube is in the vent. Should it be necessary to ease springs it should be done gently by hand.

4. He does not bring up any stores.

5. At preparation for action he satisfies himself that the buffer is properly connected up, not leaking at the glands, and contains the correct amount of oil, and that the running

out rods are properly secured; that the capsquares are properly secured, and that the lubricators on top of the cradle are filled with oil. He marks the corrections for section or gun differences and tilt corrections, in the most convenient positions for the **Setter for Range** to see and read them, and includes "gun correction" if ordered.* He supervises the work of the rest of the detachment.

3. DUTIES OF 2.

1. He opens and closes the breech and attends to the lock and tubes.

2. He brings up tray stores complete, electric and percussion tubes, spare leads and lanyards, waste, vent bit, and tallow. For a drill, a drill tube.

Tray of Stores (Gun).

(Taken up by 2 with his gun stores.)

If the need for the employment of the rimer is to be expected it should be brought out on the tray stores, also one tool withdrawing anti-friction washer.

Contents of tray stores:—

	Number.
Box, slide "A"...	1
Boxes, tube, garrison—(1 to hold spare parts)	3
Can, lubricating, No. 9...	1
Chalk, piece	1
Lanyards (side) firing, No. 7	2
Lock, E. and P. "F"	1

* Gun corrections, if ordered, are normally applied on electric range dials. If range indicator dials are being or are likely to be used, it may be convenient to show them with section or gun difference and tilt corrections.

					Number.
Screwdriver, G.S., 4-inch	...	...	...	...	1
„ No. 13	...	...	...	...	1*
Spanner, McMahon, 15-inch	...	...	...	...	1
Wrench, breech mechanism, No. 41	...	...	...	...	1
„ „ „ „ 46	...	...	...	...	1

3. At preparation for action, he fills the electric and percussion tube boxes and attaches them to the right side of the mounting in a convenient position for use. Places the spare leads on the right side of the mounting in a convenient position for use. Tests the lanyards, hands one each to 3 and 5, and attaches the other loosely to the left rail of the mounting.

Opens the breech by taking hold of the lever with his right hand and pulling it towards him as far as it will come.

Passes the vent bit down the vent from the front, carefully cleans the vent, and when finished places the vent bit in the clips on the right spring box. Examines the breech screw and threads of the breech, sees that they are clean and free from burrs, lubricates the threads with a slight film of oil, and covers the coned seating of the obturating pad lightly with tallow.

NOTE.—*Before practice with half or full charge is commenced the pad should be thoroughly softened by immersion in hot water. During cold weather pads should be replaced once a day by others which have been immersed in hot water for a few minutes. This operation should be carried out as opportunity offers, but preferably in the morning.*

Lubricates the breech mechanism thoroughly, sees that the anti-friction washer is in position, and places the box

slide "A" and lock in position. Places his oil can, tallow and waste in a convenient position for use on the right side of the mounting and the remainder of his stores in a convenient position under cover in the tray of stores.

The breech is left in the open position.

4. On the order "Load" :—

- i. At electric firing, he opens the breech, if it has been closed, by taking hold of the lever breech mechanism with his right hand.

He then inserts an electric tube with his left hand, and after 3 has called "In" closes the breech with his right, assisted by 1 if necessary, and calls "Ready." At "Battery Fire" or "Battery Fire, Fire by Order," the breech is not fully closed or "Ready" called until "Fire A.1" has been ordered by the S.C.

- ii. At percussion firing, he opens the breech if closed, presses home the extractor and cocks the lock. The gun is loaded as at electric firing. 3 or 5 then makes ready his lanyard. 2 then closes the breech until the lock commences to rise, inserts a percussion tube and fully closes the breech. 3 or 5 hooks the lanyard, calls "Ready" and stands by to fire on the order "Fire" from the Layer.

At "Battery Fire" or "Battery Fire, Fire by Order," "Ready" is not called, or the lanyard hooked, until "Fire A.1" has been ordered by the S.C.

NOTE.—At percussion firing, it is most essential that the lock be cocked before closing the breech, otherwise there is great

danger of the tube being fired prematurely owing to the pressure of the striker over the head of the tube. It is also most essential that the percussion tube shall not be inserted until the breech has been closed and the lock has started to move, as there is great danger of the tube firing prematurely when the breech is slammed. An unfired percussion tube will always be removed before the breech is opened. At percussion firing the "A" lead should be disconnected from the lock.

4. DUTIES OF 3.

1. He, assisted by 5, loads and is responsible for the muzzle cover.
2. He brings up the knee-caps.
3. At preparation for action, he gives each gun floor number a knee-cap. Brings up *Section Stores* and places them where ordered. Places lanyard under his belt. Assists 2 at lubricating the breech mechanism.

Section Stores.

(Taken up by 3 after he has taken up his gun stores.)

Borers, tube chamber, small—				
Square end	...	...	...	1
Pointed end	...	...	...	1
Brush, rammer and sponge	...	...	...	1 for each gun.
Hammer, claw	...	...	...	1
Lock, E. and P. "F"	...	...	...	1 for every 2 guns.
Pliers, side cutting, 8-inch	...	...	pair	1
Whistle	...	...	...	1

4. On the order "Load" :—

i. At electric firing he uncaps fuze, picks up projectile, keeping C.G. supported on his left arm and steadying base with his right hand, fist clenched. As breech screw swings open, he slides projectile into chamber by leaning forward, and swings round on his hips to his right to receive cartridge handed to him by 5, who has received it from 6, loads the cartridge and gives "In."

3 after loading steps back, 5 closes up with projectile. 3 receives cartridge from 6 and stands to right rear of 5 ready to hand cartridge to him. In this way 3 and 5 load alternately.

NOTE.—When loading H.E. shell, the safety pin is withdrawn during supply from recesses or depôts by 7 or 9 before lifting shell on to gun floor. At lift supply, 3 or 5 before picking up shell removes the safety pin and uncaps the fuze.

NOTE.—When using half charges 6 holds the cartridge in the centre, hands underneath, igniter to his right and hands it to 5.

5 takes the cartridge holding it at the ends, igniter in his left hand, and hands it to 3.

3 takes the cartridge, right hand on top at the extreme rear end (igniter end) and left hand underneath at the centre of the cartridge.

NOTE.—When using half charges 3 places (NOT throws) the cartridge well inside the chamber. If the cartridge is not put well in, the breech when closed smartly will project the cartridge to the front of the chamber and a missfire will probably occur.

- ii. At percussion firing, the gun is loaded as at electric firing. 3 or 5 then makes ready his lanyard. 2 then closes the breech until the lock commences to rise, inserts a percussion tube and fully closes the breech. 3 or 5 hooks the lanyard, calls "Ready," and stands by to fire on the order "Fire" from the Layer.

At "Battery Fire" or "Battery Fire, Fire by order," the lanyard is not hooked nor "Ready" called until "Fire A. 1" has been ordered by the S.C.

5. DUTIES OF 4.

1. He rams home.
 2. He brings up (assisted by 5) rammer, bucket filled with water, sponge cloth, and hook withdrawing guide bolt.
 3. At preparation for action, he places the bucket filled with water in rear of the gun, places the rammer head on the lip cut in the bucket (stave of rammer to the front), and hangs the sponge cloth on the rail in rear of the gun floor.
- Places hook withdrawing guide bolt handy for use.
Brings up *Battery Stores* and places them where ordered.

Battery Stores.

(Taken up by 4 after he has taken up his gun stores.)

Bar, testing sight	...	...	...	...	1	per work.
Buffer, syringe	...	...	...	...	1	"
Clinometer, large	...	...	...	...	1	"
Extractor tube hand, Box Slide "A"	...	...	...	...	1	"
Instrument, testing primary batteries or						
volt-ammeter	...	...	...	...	1	"

NOTE.—*The Extractor, tube, haul, box slide "A" is required when boxes Slide "A" fitted with strengthened extractors are being used. In the case of boxes slide "A" not so fitted, the Extractor, tube, special, box slide "A" will be required. This is a section store.*

NOTE.—*The instrument testing primary batteries or volt-ammeter is taken up by the senior S.C. in the battery.*

4. On the order "Load," No. 1 and 4 ram home in one motion, outer hands back up, inner hands back down and withdraw combined rammer and sponge smartly, dip it in the bucket of water after each round, and stand by to ram next round with sponge head just clear of recoil.

NOTE.—*When using paper shot and powder charges, or at salutes, the chamber will be sponged out with a damp sponge cloth, the piasaba brush will then be passed completely through the bore and the mushroom head wiped with a damp sponge cloth after each round.*

6. DUTIES OF 5.

1. He, assisted by 3, loads.
2. He, assists 4 to bring up his stores.
3. At preparation for action, he assists 4 to place the stores they have brought up and then assists the S.C. Places lanyard under his belt.
4. On the order "Load" :—
 - i. He takes the cartridge from 6 and, holding it at the ends, igniter in his left hand, hands it to 3.

- ii. He then closes up with a projectile after 3 has loaded and stepped back.
- iii. During action, he works alternately with 3 (*see* Section 4).

7. DUTIES OF 6.

- 1. He, assisted by 8, keeps gun floor supplied with bare cartridges from emplacement floor.
- 2. Assisted by 8, he brings up keys of cartridge and shell recesses and lifts. For drill, a drill cartridge and cylinder.
- 3. At preparation for action, he, assisted by 8, unlocks recesses and lifts.
- 4. On the order "*Load*," he hands up the cartridge to 5, holding it in the centre, hands underneath, igniter to his right.
- 5. Where tinfoil strips are used he will see that they are attached to the cartridge.

8. DUTIES OF 7.

- 1. He, assisted by 9, keeps gun floor supplied with projectiles from emplacement floor and, if using Lift Supply with 9, goes below and assists ammunition detail.
- 2. He, together with 9, brings up grease box, brush, 2 keys No. 5, 2 keys No. 8 (when required). For drill, a drill shell and shell extractor.
- 3. At preparation for action he, assisted by 9, prepares to issue projectiles from recesses or depôts as ordered. The projectiles are fuze, cleaned, and their grummetts are removed if not already done, 7 hands a fuze key to 3 or 5.

At lift supply they go below, 7 to the shell lift and 9 to the shell store. For drill they place drill shell and extractor in a convenient position for use.

4. On the order "*Load*" he :—

- i. Places projectiles on gun floor.
- ii. When loading H.E. shell the safety pin is withdrawn during supply from recesses or depots by 7 or 9 before lifting shell on to gun floor.

9. DUTIES OF 8.

1. He, assisted by 6, keeps gun floor supplied with bare cartridges from emplacement floor. He will affix the tinfoil strips, if necessary, to cartridges.
2. He assists 6 to bring up stores.
3. At preparation for action he will assist 6.
4. On the order "*Load*," he will pass cartridges to 6.
5. During action he will see that there are always a sufficient number of cylinders opened, and that those not for immediate use have the lids on but not screwed up.

10. DUTIES OF 9.

1. He will assist 7 to keep gun floor supplied with projectiles from emplacement floor.
2. He assists 7 to bring up stores.
3. At preparation for action he will assist 7 by removing grummets if not already done.
4. During action he will assist 7 (*see* Section 8).

11. DUTIES OF ROCKING BAR LAYER.

1. i. He lays for Line at "*Auto-Sight*."
 ii. He lays for Line at Case I.
 iii. He lays for Elevation at Case II.
 iv. He lays for Elevation at Case III.
2. He brings up Rocking bar sight bar and telescope.
3. At preparation for action, he :—
 - i. Fixes his sight in the cradle and sees that it fits and works properly.
 - ii. Tests his sight and elevation indicator and, if out of adjustment, reports to the S.C., and, under his supervision, re-adjusts.
 - iii. Sees that the traversing gear on the right side of the mounting and elevating gear in the pit are oiled and in good working order.
 - iv. Connects up and examines the firing circuit and tightens up and examines all binding screws and terminals on the right of the mounting.
4. During action, he :—
 - i. Repeats and applies corrections for Line at "*Auto-Sight*."
 - ii. Orders **Auto-Sight Layer** to "Elevate" or "Depress" at Case I.
 - iii. Keeps gun laid at elevation passed by **Setter for Range** at Cases II and III.
 - iv. At electric firing, he fires at Case I.
 - v. At percussion firing, he orders "*Fire*" at Case I.
 - vi. At electric or percussion firing he calls "*On*" at Cases II and III.

12. DUTIES OF AUTO-SIGHT LAYER.

1. i. He lays for Elevation at "*Auto-Sight*."
 - ii. He "Elevates" and "Depresses" the gun at Case I as directed by the **Rocking Bar Layer**.
 - iii. He lays for Line at Case II.
 - iv. He lays for Line at Case III.
2. He brings up Auto-sight sight bar and telescope.
3. At preparation for action, he :—
 - i. Fixes his sight in the cradle and sees that it fits and works properly.
 - ii. Tests his sight, and if out of adjustment, reports to the S.C. and, under his supervision, re-adjusts.
 - iii. Sees that the elevating and traversing gears on the left side of the mounting, and traversing gear in the pit, are oiled and in good working order, and the mounting traverses easily.
 - iv. Connects up and examines the electric firing circuit and tightens up and examines all binding screws, terminals, spare leads and contacts on the left side of the mounting.
 - v. Datums the auto-sight under the supervision of the **S.C.**
4. During action, he :—
 - i. Repeats and applies corrections for tide lever.
 - ii. At Case III, repeats and applies corrections for Line to the training arc pointer. Where the latest pattern training arc pointer is provided he keeps the pointer set to the range.

- iii. At electric firing, he FIRES at auto-sight, Case II and Case III, provided that at Case III the pistol grip is within his reach, otherwise he will order the **Setter** who is nearest the pistol grip to fire.
- iv. At "Auto-Sights" electric firing at night he calls "On" before firing as a signal to the **Rocking Bar Layer** to close his eyes and duck his head.
- v. At percussion firing, he orders "Fire" at auto-sights, Case II and Case III.

13. DUTIES OF SETTER FOR RANGE.

- 1. He assists the **Rocking Bar Layer** at Cases I, II and III, and the **Auto-Sight Layer** at "Auto-Sight."
- 2. He brings up pistol grip and range dials (if not on the mounting), and will assist the **Auto-Sight Layer** to bring up and set in position the electric firing battery if not already on the mounting.
- 3. At preparation for action, he :—
 - i. Places pistol grip in position.
 - ii. Uncovers or places in position the range dial and sees that it is properly connected up.
 - iii. Checks the range dial under the supervision of the **S.C.**
 - iv. Assists the **Rocking Bar Layer**.
- 4. During action, he :—
 - i. Repeats and applies corrections for Line and Range to the automatic sight at "Auto-Sight."
 - ii. Repeats and applies corrections for Line and Range to the **Rocking Bar Sight** at Case I.

- iii. Repeats and applies corrections for Range to moveable face of electric range dial at Case II and Case III.
- iv. Calls Ranges to the **Rocking Bar Layer** at Case II and Case III and applies them to the **Rocking Bar Sight** at Case I.

14. DUTIES OF SETTER FOR TRAINING.

- 1. He assists the **Auto-Sight Layer** at Case III.
- 2. He brings up training dial (if not on the mounting) and concentration table if required.
- 3. At preparation for action, he :—
 - i. Uncovers or places in position the training dial and sees that it is properly connected up.
 - ii. Checks the training dial under the supervision of the **S.C.**
 - iii. Assists the **Auto-Sight Layer**.
- 4. During action, he :—
 - i. At "*Auto-Sight*," Case I and Case II, applies all correction for Line ordered, to the deflection leaf of the training arc pointer. He makes the reading of the training dial agree with the reading of the training arc pointer by means of the moveable face of the training dial. Where the latest pattern training arc pointers are provided he keeps the pointer set to the range.
 - ii. At Case III calls trainings shown on the training dial to the **Auto-Sight Layer**.

CHAPTER II.

PREPARATION FOR ACTION.

(See "Coast Artillery Training, Vol. I.," Secs. 41, 42, and 196.)

15. PROCEDURE.

1. On the order from the B.C. to "Prepare for action," the detachment is moved into the work, and halted in the position of "Detachment rear." Rifles are placed in the arm racks, accoutrements and jackets are removed, all gun floor numbers remove their boots and place them under cover and put on gun floor shoes and knee caps. The detachment then falls in as before.

If more than one gun of a section is being manned, each No. 1 marches his detachment to his gun as above, or to such other convenient position under cover as the S.C. may direct.

2. The S.C. details which detachment will be responsible for taking up *Section and Battery stores*, and orders "*A Section Prepare for Action*," the No. 1 marches the detachment to the store and supervises the issue of the stores laid down for each number.

The S.C. provides himself with and takes up the gauge protrusion striker and instrument testing primary batteries or volt-ammeter. (The latter is "a Battery store.")

NOTE.—When there is more than one section in the battery, the senior S.C. will take up the instrument testing primary batteries or volt-ammeter. He will also detail one of his detachments to take up the battery stores.

3. The No. 1 then marches his detachment to the gun, and on arrival at the emplacement floor all stores are put down, and the detachment stands round and uncovers the gun. 2 removes breech cover, 3 muzzle cover, and the remainder the gun cover. After this has been done "*Detachment Rear*" is formed.

If Instructional Drill is being carried out the No. 1 then orders "*Take Post,*" and the detachment double to their positions.

4. The No. 1 then orders "*A. 1 Prepare for Action.*"

The gun is then prepared for action, each number carrying out the duties laid down in Chapters I and II.

After each man has completed his work he takes post at his position in action.

16. REPORTS.

The No. 1 when he sees that the work has been completed, and that the numbers are in their positions in action calls his detachment to "*Attention,*" and collects reports as follows:—

No. 1 "*A. 1, Attention—Reports—Two.*" 2, "*Correct*" or otherwise. "*Three*" 3, "*Correct,*" or otherwise, and so on through the whole detachment, finishing with the **Layers and Setters.**

He then points out to his detachment the position of the *Section and Battery Stores* and *Gun Stores*, sees that the bore is clear, and orders his detachment under cover.

The numbers double to and sit on the forms on the emplacement floor.

17. DUTIES OF SECTION COMMANDER.

During the preparation of the gun for action, the S.C. personally examines and gauges the protrusion of the strikers of all the locks (including spare) in his section.

NOTE.—To gauge the protrusion of the striker. Disconnect the "A" lead, remove the lock and apply the "gauge protrusion striker." Ascertain by inspection that the point of the striker is central, and that there are no pieces of foreign metal between the point of the striker and the edge of the firing hole.

With the lock still out but with the "A" lead connected to it, he tests the pistol grip and measures the voltage of the circuit at the point of the striker with the I.T.P.B. or volt-ammeter with the pistol grip in each of its three positions, the No. 1 marking, in chalk the voltage obtained, on the right side of the gun when the pistol grip is on the right side, on the left side when the pistol grip is on the left side, and on the shield when the pistol grip is in the Case III position.

NOTE.—Should the voltage be less than 1, the battery will be tested cell by cell, and the bad cell or cells made good, or removed and replaced by fresh cells.

If either of the sights or the elevation indicator is reported out of adjustment, the S.C. supervises its adjustment and datuming.

Gives orders to the ammunition numbers with regard to the arrangement and disposal of cartridges and projectiles. Supervises the checking of range and training dials.

The No. 1 sits his detachment at ease and reports to the S.C. "A. 1. Bore Clear—Ready to Load."

The S.C. when he has finished his work, goes to the gun and says to the No. 1, "*I will inspect A. 1.*" On this the No. 1 calls his detachment to attention and gives the order, *Layers, 2, and 3—Take Post.*" The No. 1, **Layers, 2, and 3** double to their positions in action.

18. INSPECTION BY SECTION COMMANDER.

The S.C. makes sure that the *Recoil, Laying, Firing* and *Ammunition* arrangements of the gun are correct by asking the numbers, and by inspection if necessary.

He then orders **2** to close the breech and open it again. He examines the pad to see if it fits correctly, which he ascertains by seeing if it is covered all over with tallow, and then orders **2** to smear it with same.

He then orders **2** to insert an electric tube and close the breech, and the **L ayer** to fire the tube by pulling the trigger. The breech is then opened and the fired electric tube extracted.

He then orders **2** to press home the extractor, cock the lock, start closing the breech, and when the lock begins to move to insert a percussion tube, and then finish closing the breech. He next orders **3** to hook the lanyard and fire the tube. After firing he directs **3** to unhook and **2** to draw back the L.B.M. just sufficiently to unmask the tube. He examines the tube, and if it has not been struck centrally he adjusts the lock by means of the adjustable bush of the catch retaining L.B.M. and orders another percussion tube to be fired. If the tube has been struck centrally, the breech is fully opened, the tube extracted and the vent and chamber thoroughly cleaned.

After the inspection the No. 1 orders "*Layers, 2, and 3 Under Cover*" and sits his detachment at ease.

NOTE.—*All spare locks should in addition be submitted to the foregoing tests under the S.C.'s supervision.*

The breech of an unloaded gun is left open unless the S.C. orders it to be closed, *e.g.*, when loading will not take place for some considerable time.

The S.C. then reports "*A Section Ready to Load*," or if he has previously been ordered to load, he orders the guns to be loaded and reports "*A Section Ready for Action*."

NOTE.—*If guns are employed in the A.T.B. Defence Scheme, in thick weather and after preparation for action for the night, the S.C. will always order his guns to be loaded, and his gun look-outs to take post.*

His report under these circumstances will be "A Section — Ready for Action."

CHAPTER III.

GUN DRILL.

19. GENERAL INSTRUCTIONS.

Coast Artillery Training lays down the principles of fighting the armament of a coast fortress. The gun drill with each nature of armament is laid down in the respective Gun Drill pamphlets. This chapter details the orders given, and the

procedure by which these orders are carried out in the case of the 6-inch, Marks VII and VII* guns (land service).

The procedure must be memorized and strictly adhered to.

The executive order is shown throughout as being given by the **S.C.**, as will normally be the case during training.

Instructors will invariably employ the orders detailed for the **S.C.**, even when drilling a single detachment.

20. REPEATING OF ORDERS.

The **S.C.**'s orders "*Stand fast*," "*Take Post*," "*Under Cover*," or "*A Section—Fire*" are never repeated, but are acted upon at once.

All his other orders must be repeated, or be followed by an executive order by the No. 1.

21. THE DETACHMENT.

The detachment consists of a No. 1, a **Rocking Bar Layer**, an **Auto-Sight Layer**, a **Setter for Range**, a **Setter for Training**, and 8 other gun numbers.

22. TO FALL IN.

The detachment falls in two deep, one pace between ranks, 1 on the left of the front rank.

23. TO TELL OFF.

Section commander.

"*A Section—Tell off.*"

1 numbers himself 1, the right hand man of the rear rank 2, his front rank man 3, and so on. The **Layers** and **Setters** do not number.

(B 27—36)

A 5

G1.C.	A5.L.	R.B.L.	9	7	5	3	(Front rank).
	Setter	Setter	8	6	4	2	(Rear rank).
	(Training)	(Range)					

After telling off, if the weather is cold, all men are warned to keep their hands as warm as possible, as cold hands lead to slow rates of fire.

24. POSITIONS AT DETACHMENT REAR.

Formed up and told off as in 23 above, halted in line facing the front, on the emplacement floor at the rear of the mounting.

25. TO FORM DETACHMENT REAR.

(From positions of "under cover" or "in action.")

S.C.	No. 1.
"A Section. Detachment—	"A.1. Double—March."
Rear."	

1 doubles to his place (in rear of the gun on the emplacement floor, facing the front), and gives the order "A.1.—Double March." At the order from 1, the remainder double to their places and halt.

26. TO PROVE.

To ascertain that the men are in their correct places the detachment may be proved as follows:—

No. 1.

"A.1.—Prove your numbers."

"2," "3," &c. "Down."

The number called on will raise his right arm, and extend it smartly to the front, hand open and as high as the shoulder,

thumb upwards; when the next number is called, he will drop his arm; at "Down," the last number called will drop his arm.

27. TO STAND FAST.

S.C.

No. 1.

"A Section—Stand Fast."

All stand fast whatever they are doing. At the order "Go on," work is continued.

NOTE.—In peace practice the bugle call "Stand Fast" is acted upon at once by everyone and is followed by the order "Make Safe" from the S.C.

28. TO CHANGE ROUND.

S.C.

No. 1.

"A Section—Change Round."

The front rank takes one pace to the left. 1 takes one pace to his rear and one pace to his right, thus becoming **Setter for Training**. 2 takes one pace to his front, thus becoming 3.

(The detachment is then again told off.)

29. POSITIONS UNDER COVER.

No. 1 and 2 on right of gun.

3, 4, and 5 on left of gun.

6, 7, 8, and 9 in rear of gun.

Layers and Setters according to method of laying.

(B 27—36)

A 6

30. TO TAKE POST UNDER COVER.

(From "detachment rear" or "in action.")

S.C.	|	No. 1.
"A Section—Under cover."		

All double to their positions under cover.

31. POSITIONS IN ACTION.

No. 1 on the right side of the rammer.

Layers and Setter for Range on sighting steps, or, if the method of laying has been ordered, at the positions detailed afterwards for that method of laying.

Setter for Training at the training dial.

2 in rear of gun in prolongation of right side of gun, left ot in front, facing Auto-Sight Layer.

3 close up to breech on left side and facing 2.

4 on left side of rammer.

5 to rear of 3.

6, 7, 8, 9 at recess, depot or lifts as ordered.

32. TO TAKE POST IN ACTION.

S.C.	|	No. 1.
"A Section—Take Post."		

All double to their positions in action.

33. TO TEST CIRCUIT.

NOTE.—This test is necessary only when guns have been prepared for action some considerable time before the order to load is given.

S.C.	|	No. 1.
"A Section—Test Circuit."		"A. 1—Test Circuit."

2 opens the breech, if closed, short circuits the striker to some part of the gun, and calls "*Test*," the Layer presses the lever indicator, and, if there is a deflection calls "*Correct*"; if there is no deflection, he calls "*No Circuit*."

If there is no time to overhaul the circuit, the S.C. orders "*A. 1—Change to Percussion*."

34. TO LOAD.

S.C.	No. 1.
" <i>A Section.....Load.</i> "	" <i>A. 1.....Load.</i> "

NOTE.—The S.C. does not give this order until the numbers are standing steady in their places, or until the circuits have been reported correct.

Electric firing.—

2 opens the breech, if it has been closed, by taking hold of the lever breech mechanism with his right hand and pulling it towards him as far as it will come.

7 or 9 places projectile on gun floor.

3 uncaps fuze, picks up projectile, keeping C.G. supported on his left arm and steadying base with his right hand, fist clenched. As breech screw swings open, he slides projectile into chamber by leaning forward, and swings round on his hips to his right to receive cartridge handed to him by 5, who has received it from 6.

No. 1 and 4 ram home in one motion, outer hands back up, inner hands back down and withdraw combined rammer and sponge smartly, dip it in the bucket of water after each round, and stand by to ram next round with sponge head just clear of recoil.

3 loads the cartridge and gives "*In*."

2 inserts an electric tube with his left hand, closes the breech with his right, assisted by 1 if necessary, and calls "Ready."

At "Battery Fire" or "Battery Fire, Fire by Order," the breech is not fully closed nor "Ready" called until "Fire A. 1" has been ordered by the S.C.

3 after loading steps back, 5 closes up with projectile. 3 receives cartridge from 6 and stands to right rear of 5 ready to hand cartridge to him. In this way 3 and 5 load alternately.

Percussion firing.—

NOTE.—At percussion firing the "A" lead should be detached, as it may cause a missfire.

2 opens the breech, if closed, presses home the extractor and cocks the lock.

The gun is loaded as at electric firing. 3 or 5 then makes ready his lanyard. 2 then closes the breech until the lock commences to rise, inserts a percussion tube and fully closes the breech. 3 or 5 hooks the lanyard, calls "Ready," and stands by to fire on the order "Fire" from the Layer.

At "Battery Fire" or "Battery Fire, Fire by Order," the lanyard is not hooked nor "Ready" called until "Fire A. 1" has been ordered by the S.C.

35. TO MAKE SAFE.

S.C. .	No. 1.
"A Section—Make Safe."	"A. 1—Make Safe."

Electric firing.—

2 pulls the lever towards him sufficiently to unmask the tube.

Percussion firing.—

3 or 5 unhooks the lanyard; 2 pulls the lever towards him sufficiently to unmask the tube.

36. TO LAY AND FIRE.**General Instructions for Laying and Firing.**

The words "*yards*," "*clicks*," "*deflection*" are understood and are never given.

Corrections to tide levers are repeated and set by the **Auto-Sight Layer**.

Corrections for range and deflection are repeated and applied, if possible, by the **Setters**; if not possible, then the **Layer** repeats and applies.

To enable the **S.C.** to hear whether initial corrections are repeated correctly, the **Layers** and **Setters** concerned face him and repeat in order from *right* to *left* throughout the section.

Setters will, if necessary, pass on orders to **Layers**.

The **Layer for Elevation** calls "*On*" (except at Case I and "*Auto-Sight*" by day), and after this caution the **Layer for Line** fires or orders "*Fire*."

When changing from one target to another, or whenever quick traversing is required, the breech numbers push on the breech of the gun under the **Layer's** directions ("*Trail Right*" or "*Left*").

When changing from Case II to **Auto-Sight** laying the **Auto-Sight Layer** continues to lay for line until the **Rocking Bar Layer** orders "*Unclamp*." The **Rocking Bar Layer** does not give this order until he has applied the deflection and found the target.

AUTO-SIGHT.**Positions.**

Auto-Sight Layer and Setter for Range at Auto-Sight.
Rocking Bar Layer at Rocking Bar Sight.

Initial Corrections.

S.C. " *A Section Tide Levers.....Ft. Rise (or Fall).*"
Auto-Sight Layer " *A. 1 Tide Lever.....Ft. Rise (or Fall).*"

S.C. " *A Section Add (or Drop).....[clicks].*"

Setter for Range " *A. 1 Add (or Drop).....[clicks].*"

S.C. " *A Section [deflection].....[minutes] Right (or Left).*"

R.B. Layer " *A. 1 [deflection].....[minutes] Right (or Left).*"

Setter for Range " *A. 1 [deflection].....[minutes] Right (or Left).*"

Layers and Setter apply corrections they have repeated and repeat and apply all subsequent corrections.

NOTE.—*If sights have been datumed corrections are applied starting from the false zero marks if such have been made.*

To Lay.

The **Auto-Sight Layer** lays for elevation and fires or orders "*Fire.*" At night he calls "*On*" before firing as a caution to the **Rocking Bar Layer**.

The **Rocking Bar Layer** lays for line.

To Fire.**Electric firing.—**

At "*Battery Fire*" or "*Battery Fire, Fire by Order*," when the S.C. orders "*Fire A. 1*," 2 closes the breech and calls "*Ready*." The **Auto-Sight Layer** lays for elevation and fires. The **R.B. Layer** lays for line.

At "*Gun Fire*" the S.C. orders "*A Section Fire*," the breech is closed, the **Auto-Sight Layer** fires as soon as possible after "*Ready*" is called, and fire is continued as rapidly as possible.

The order "*Fire*" from the S.C. is not required when changing from "*Battery Fire*" or "*Battery Fire, Fire by Order*" to "*Gun Fire*."

Percussion firing.—

Similar to Electric firing except that 3 or 5 hooks the lanyard and calls "*Ready*," **Auto-Sight Layer** calls "*Fire*," and on the order "*Fire*" 3 or 5 pulls the lanyard and fires the gun.

CASE I, ROCKING BAR SIGHT.
Positions.

Auto-Sight Layer at Auto-Sight.

Rocking Bar Layer and **Setter for Range** at Rocking Bar Sight.

Initial Corrections.

S.C. " *A Section Add (or Drop)*.....[yards]."

Setter for Range " *A. 1 Add (or Drop)*.....[yards]."

S.C. " *A Section [deflection]*.....[minutes] *Right (or Left)*."

Setter for Range " *A. 1 [deflection]*.....[minutes] *Right (or Left)*."

Auto-Sight Layer " *A.1 [deflection]*.....[minutes] *Right (or Left)*."

Layer and Setter apply corrections they have repeated, and repeat and apply all subsequent corrections.

To Lay.

Auto-Sight Layer " *Elevates* " and " *Depresses* " as ordered by the **R.B. Layer**.

Setter sets the Rocking Bar Sight to the Range.

R.B. Layer lays and fires, or orders " *Fire*," traversing himself and ordering the **Auto-Sight Layer** to " *Elevate* " or " *Depress*," as he considers necessary.

NOTE.—*Ranges set by Setter include Gun and Section Difference Corrections if any.*

To Fire.

Similar to Auto-Sight, except that **R.B. Layer** fires, or at *Percussion Firing* calls " *Fire*."

CASE II.**Positions.**

Auto-Sight Layer at Auto-Sight.

Rocking Bar Layer at Elevation Indicator.

Setter for Range where he can see the Range Dial.

Initial Corrections.

S.C. " *A. Section Add (or Drop).....[yards].*"

Setter for Range " *A. 1 Add (or Drop).....[yards].*"

S.C. " *A Section [deflection].....[minutes] Right (or Left).*"

Auto-Sight Layer " *A. 1 [deflection].....[minutes] Right (or Left).*"

Layer and Setter apply corrections they have repeated and repeat and apply all subsequent corrections.

To Lay.

The **R.B. Layer** keeps gun layed at elevation called by **Setter** and calls " *On.*"

The **Auto-Sight Layer** lays for line and fires, or orders " *Fire.*"

NOTE.—*Ranges called by Setter include Gun, Section Difference and Tilt Corrections if any.*

To Fire.

Similar to Auto-Sight except that **R.B. Layer** calls " *On* " and **Auto-Sight Layer** fires or at *Percussion Firing* orders " *Fire.*"

CASE III.**Positions.**

Auto-Sight Layer at Lower Traversing Wheel.

Setter for Training at Training Dial.

Rocking Bar Layer at Elevation Indicator.

Setter for Range at Range Dial.

NOTE.—*The pistol grip will be taken below and placed in the lower position by the Auto-Sight Layer.*

Initial Corrections.

S.C. "A Section Add (or Drop).....[yards]."

Setter for Range "A. 1 Add (or Drop).....[yards]."

S.C. "A Section [deflection].....[minutes] Right (or Left)."

Setter for Training "A. 1 [deflection].....[minutes] Right (or Left)."

Setters apply corrections they have repeated.

Setter for Range repeats and applies all subsequent corrections for range.

Auto-Sight Layer repeats and applies all subsequent corrections for line to the training arc pointer.

NOTE.—*Subsequent corrections for line are ordered in [minutes] "More Right (or Left)."*

To Lay.

R.B. Layer keeps gun layed at elevations called by **Setter for Range** and calls "On."

Auto-Sight Layer keeps gun layed at trainings called by **Setter for Training** and fires, or orders "Fire."

NOTE.—*Ranges called by Setter for Range include Gun and Till Corrections, if any.*

Trainings called by Setter for Training include Concentration Corrections, if any, and Drift Corrections.

To Fire.

The R.B. Layer calls "On" and Auto-Sight Layer fires, and at Percussion Firing, he orders "Fire."

NOTE.—*The Setter who is nearest the pistol grip fires if Auto-Sight Layer cannot reach pistol grip.*

NIGHT FIRING.

It is most important that Layers who are being trained for night firing shall at all times be made to duck their heads and close their eyes on firing when laying through telescopes, e.g., at Auto-Sight laying the Auto-Sight Layer calls "On," ducks and fires. The R.B. Layer on hearing "On" also ducks.

At Case II laying the Auto-Sight Layer ducks and fires or calls "Fire."

After Firing.

As soon as the gun is fired, 3 or 5 unhooks the lanyard (if at percussion firing), 2 opens the breech. The gun is at once reloaded.

3 and 5 tuck their lanyards under their belts while loading.

NOTE.—*In order to keep the mushroom head of the obturator from becoming too hot, it will be necessary to utilize every interval*

in the firing for cooling it by the application of thoroughly saturated cloths. Thirty rounds may be fired with the greatest rapidity without delaying the fire, but after thirty rounds a pause of about thirty seconds should be made for cooling, and if continuous rapid fire is still desired, this pause will have to be repeated about once in ten rounds.

The white metal disc of the obturator must be watched for any signs of fusion, and if the metal should begin to melt the firing ought to be suspended for thirty seconds, in order to cool the mushroom head. Firing can then be resumed, but it would be more satisfactory to change the axial vent and discs, for which about one minute is required.

37. DRILL WHEN PASSING RANGES AND TRAININGS BY HEAD AND BREAST TELEPHONES.

Preparation for Action.

Stores required:—

Auto-Sight Layer ... Telephones, head and breast, sets, 1.

Rocking Bar Layer ... Telephones, head and breast, sets, 1.

The **Auto-Sight Layer** will connect his telephone to lines 5 and 6 (disconnecting the training dial, if on the mounting), adjust the head clips and tape support, make contact with the microphone, and report to the S.C. "A. 1 Training Telephone connected up."

The **Rocking Bar Layer** will connect his telephone to lines 3 and 4 (disconnecting the range dial, if on the mounting), adjust the head clips and tape support, make contact with the microphone, and report to the **S.C.** "*A. 1 Range Telephone connected up.*"

When the **S.C.** has received reports from all guns that the telephones are connected up he will call up the rangefinder and order "*Test Telephones.*"

When the training telephonist calls "*A. 1,*" the **Auto-Sight Layer** at **A. 1** will reply "*Auto-Sight Layer, A. 1.*" When the training telephonist calls "*A. 2,*" the **Auto-Sight Layer** at **A. 2** will reply "*Auto-Sight Layer, A. 2.*"

When the range telephonist calls "*A. 1,*" the **Rocking Bar Layer** at **A. 1** will reply "*Rocking Bar Layer, A. 1.*" When the range telephonist calls "*A. 2,*" the **Rocking Bar Layer** at **A. 2** will reply "*Rocking Bar Layer, A. 2.*"

When all telephones have answered, the **B.C.'s** telephonist at the range-finder will report to the **S.C.** "*Telephones Correct.*"

NOTE.—*If no reply is received from any layer the fact will be reported to the S.C. from the range-finder and the connections on the gun examined.*

During Action.

On the order "*Case III, Observe,*" the layers will take post, fit their telephones, and await orders from the range-finder. The range and training telephonists will call the layers as at preparation for action. When the range-taker has reported "*On Target,*" the range telephonist will call "*Lay,*" and both telephonists will pass ranges and trainings in the usual manner.

Ranges and trainings are NOT repeated by the layers.

NOTE.—*In order to ensure that all layers are in communication it is advisable, during any pause in the action, that the telephonists at the range-finder should call them up and receive replies as at preparation for action.*

Should the range-finder be off the target the range telephonist will call "*No range,*" and both telephonists will stop calling ranges and trainings. The **Rocking Bar Layers** will report "*A. 1 (or A. 2) No Range.*"

When the range-finder is again on the target the range telephonist will call "*Lay,*" and both telephonists will pass ranges and trainings.

The **Rocking Bar Layers** will repeat "*A. 1 (or A. 2) Lay,*" and the gun will be layed as before.

Corrections.

Wherever possible, the **B.C.** will order corrections both for range and training to be applied to the range-finding instruments.

Where this is not possible, the **B.C.** will order net corrections to range and training telephonists in the form "*Always*" "*Add (or Drop).....yards.*" "*Always.....*" "*More Right (or Left).*"

Telephonists will apply these corrections to ranges and trainings before telephoning ranges and trainings to the layers.

Corrections for Section or Gun difference (if any) will be noted by the **Rocking Bar Layer** and added to, or deducted from, the range received.

Should a "*gun correction*" be necessary, it will be called to and repeated by the **Rocking Bar Layer**, who will apply it by correcting the range received.

Corrections for line will be repeated as "*More Right*" or "*More Left*" by the training telephonist and called by him to the **Auto-Sight Layers**, who will repeat them and apply them to the training arc pointer.

Corrections for concentration and drift will be applied to the training arc pointer by the **Auto-Sight Layer**. With the later pattern pointers they will be applied by setting the pointer to the range.

38. MISS-FIRES.

Electric Firing.

If, when the **Layer** pulls the trigger, the gun fails to fire, he releases the trigger and calls out "*Close the Breech.*"

No. 1 gives the L.B.M. a tap with the rammer, and ascertains by inspection that it is home; he then calls "*Ready.*" After "*On*" has been called the **Layer** again pulls the trigger, and if the gun again miss-fires, he holds the trigger pulled while he counts "*One, Two, Three, Four,*" aloud, in slow time; if it still fails to fire he releases the trigger and calls "*A. 1, Missfire.*"

The **Layers** continue to follow the target.

The No. 1 then orders "*Stand Clear,*" and all the numbers stand clear of the vent.

The No. 1 turns rammer end for end, and assisted by 2, inserts hook into link guide bolt and pulls it back, keeping to right rear of vent. 4 withdraws lever guide bolt with hook withdrawing guide bolt and when withdrawn unhooks hook withdrawing guide bolt.

2 strikes down on the rammer with both hands, thus ejecting the tube. The No. 1 unhooks rammer. The nearest number

picks up the tube and shows it to the No. 1, who sees whether it has fired or not.

Tube not fired. If the tube has not fired, the No. 1 orders "Go On," and 2 inserts a new electric tube, raises the lock and keeps it up while 4 releases lever guide bolt. When 4 is clear 2 calls "Ready."

NOTE.—Should there be reason to suspect that the electric firing circuit is out of order, change may at once be made to percussion, in which case No. 1 orders "Change to Percussion—Go on"; 2 cocks the lock, inserts a percussion tube, raises the lock and keeps it up, while 4 releases the lever guide bolt. 3 or 5 hooks the lanyard and calls "Ready."

The **Layer for Elevation** calls "On" and the **Layer for Line** again tries to fire. Should a second miss-fire occur the same procedure is carried out, except that if it is again the tube which has not fired percussion firing is resorted to, the No. 1 ordering "Change to Percussion—Go On."

NOTE.—It is most important that percussion firing should not be resorted to except as a last resource, and every care should be taken of the firing circuit in consequence. At the same time, it is even more important that guns should be kept in action. Should percussion firing have been resorted to, advantage should be taken during any pause in the firing to put the circuit right and resume electric firing.

Tube fired. If the tube has fired, the detachment, except the **Layers** and **Setters**, "Take Cover" by order of the No. 1.

In peace practice the **Layers** keep the gun layed in a safe direction. (In War the safest direction is that of the vessel being engaged.)

After a pause of ten minutes the No. 1 orders "4 Take post" and raises the lock, standing well clear, 4 releasing lever guide bolt. No. 1 and 4 then place a bucket filled with water beneath the breech of the gun. The No. 1 then places himself clear of the breech on the left side and opens the breech by applying the rammer to the lever breech mechanism.

After a further pause of one minute, the No. 1 leans over the breech of the gun and removes the cartridge. He then examines the igniter.

- i. If the igniter is smouldering, he drowns the cartridge in the bucket of water, and orders "A. 1 Take post, Cartridge only Load, 2 Go On." 3 or 5 loads a cartridge and 2 cleans the vent and inserts a fresh tube.
- ii. If the igniter is dry and serviceable he uses the cartridge again, adjusting it carefully in the chamber and ordering "A. 1 Take post, 2 Go On," 2 cleans the vent and inserts a fresh tube. Firing is then resumed. When, however, the cartridge cannot be used up the same day or night at the practice in progress it must be destroyed.
- iii. If the igniter appears to be wet or damp the cartridge must be destroyed. Firing is then resumed.

NOTE.—"Take Cover" does not mean taking up "positions under cover," but means going to positions of safety should the gun happen to fire. Cartridge cylinders will also be put in a position of safety. A sentry should in addition be detailed to prevent persons walking in rear of the gun.

Instructions for the destruction of cordite are contained in the Regulations for A.O. Services, Part II.

Percussion Firing.

If, when 3 or 5 pulls the lanyard, the gun fails to fire, 3 or 5 unhooks the lanyard and calls out "*Close the Breech.*" No. 1 cocks the lock with the hook on the end of the rammer, gives the L.B.M. a tap with the rammer, and ascertains by inspection that it is home.

3 or 5 rehooks the lanyard and calls "*Ready.*" The Layer then again orders "*Fire*" after "*On*" has been called, and if the gun again missfires 3 or 5 calls "*A. 1 Missfire.*"

No. 1 cocks the lock with the hook on the end of the rammer and orders "*Stand Clear.*"

The tube is then extracted and examined by the No. 1 as at electric firing.

If the tube has been struck but has not fired a second tube is inserted, and should the second tube fail to fire the lock will be changed.

If the tube has not been struck the lock will be changed at once.

If the tube has fired, pauses will be made and the procedure carried out as for a missfire at electric firing.

NOTE.—*It is most important that the lock shall be cocked before ejecting a missfire percussion tube, otherwise there is great danger of the tube being fired, owing to the pressure of the striker over the head of the tube when the lock is lowered to eject the tube.*

An unfired percussion tube will always be removed before the breech is opened.

The foregoing missfire drill should never, if possible, be practised on a Service gun, but only on a loader fitted with breech mechanism. Untrained men may seriously damage

guide bolts, and continuous practice at this form of drill on a service gun will, with even the best trained men, tend to weaken its guide bolts.

39. TO STOP FIRING.

Section Commander.

"A Section—Stop."

The detachment continue their duties, but the gun is not fired until the order "Go on" is given.

40. TO STOP LOADING.

Section Commander.

"A Section—Stop loading."

The detachment continue their duties. Any gun already loaded is fired at its proper interval, but no gun will be loaded until the order "Go on" is given.

41. TO EMPTY GUNS.

Section Commander.

"A Section—Empty guns."

Any gun loaded is laid at the last elevation and line, and fired.

If a safety pin or cap has been removed before the order is given, the loading is completed and the gun fired.

NOTE.—*In peace practice the layer keeps the gun laid in a safe direction. (In war, the safest direction is that of the vessel being engaged.)*

42. TO UNLOAD (CARTRIDGE ONLY).

S.C.	No. 1.
“ A Section. Cartridge only— Unload.”	“ A. 1. Cartridge only— Unload.”

2 opens the breech, 3 or 5 takes out cartridge, turns and hands it to 5 or 3, who hands it to the No. 1, by whom it is examined. If the igniter is damp, the cartridge will be set aside. If the igniter is dry and serviceable it may be loaded into the gun again, provided there is an opportunity for firing it the same day or night at the practice then in progress. If it cannot be so fired it will be set aside and returned to the R.A.O.C. for examination.

Cartridges with damp igniters will never be loaded in a gun, but returned to R.A.O.C. for exchange of igniter.

NOTE.—A No. 1 before giving the order to load at night should always search the gun with the slave of the rammer, and if he feels a shell in a bore, should at once order “ Cartridge only Load ” and keep the head of the rammer in the breech opening until he sees the cartridge up at the gun ready to be loaded. This procedure prevents double shelling. In the day-time he should always look to see that the bore is clear before giving the order to load.

43. TO CEASE FIRING.

Before “ Cease firing ” is ordered guns must be empty.

Section Commander.

“ A Section—Empty guns, cease firing.”

(At drill the gun, if loaded, is unloaded.)

The **L**ayer laying for elevation depresses the gun. The dials are run back to stops, the **S**etters checking them. The gun is stripped of its stores by the numbers who put them on, is then washed out, if necessary, and the breech closed. The detachment stands round and replaces the covers—2 the breech cover, 3 the muzzle cover, the remainder the gun cover.

The numbers pick up the stores they brought up when preparing for action, fall in at "*Detachment Rear*" and are marched back to the store. Stores are handed in, checked, and the No. 1 collects reports as to deficiencies.

44. CASUALTIES.

(See also "Coast Artillery Training, Vol. I, 1921," Sec. 55.)

S.C. by the senior No. 1 in the Section.

No. 1, **L**ayers and **S**etters and loading numbers by named successors who are generally employed in the detachment among the higher numbers supplying ammunition under cover.

NOTE.—*Any stores which are being used by a number who is casualtied will be left by him on the gun floor or will be taken from him, e.g., at percussion firing the lanyards used by 3 and 5.*

45. MISHAPS WHICH MAY OCCUR, AND DRILL FOR OVERCOMING THEM.

Dropped shell.—

If 3 drops a projectile when loading it, 5 hands him the cartridge, which he (3) turns end for end, 5 then picks up his shell and loads it, and 3, having in the meantime walked

round in rear of 5, hands him the cartridge back again. The dropped shell is picked out of the way at the first convenient pause.

NOTE.—Turning the cartridge end for end is only necessary when using half charges.

Dropped cartridge.—

If a cartridge is dropped, another cartridge is at once handed up.

Stiff breech.—

No. 1 drops off the rammer and assists 2.

Bent or jammed tube (breech open).—

2 passes the vent bit across to 4, who inserts it from the front, and ejects the tube, 2 keeping his eye clear of the vent. 2 replaces the vent bit at the first convenient opportunity.

Bent or jammed tube (breech closed).—

If the breech is in the closed position and cannot be opened 2 calls "*Jammed Tube*," 8 passes up the Extractor Tube, hand (*Battery Store*), or the Extractor Tube, Special (*Section Store*), and 2 extracts.

NOTE.—A dropped electric tube should never be used until it has passed the Continuity Test.

46. INSTRUCTIONS AS TO FIRING BLANK AMMUNITION.

1. *Loading.*—A B.L. gun will not be reloaded within 30 seconds after firing, and not even then until the chamber and bore have been sponged out and examined by 1.

2. *Sponging*.—The chamber will be sponged out with a damp sponge, the piasaba brush passed completely through the bore, and the mushroom head wiped with a damp cloth after each round.

3. *Miss-fires*.—In the event of a miss-fire a second attempt to fire the gun will be made when its turn again comes round. Should the gun again miss-fire the breech will not be opened for at least one minute, when firing powder, and ten minutes when firing smokeless charges. No one must be in rear of the breech when it is opened.

CHAPTER IV.

AMMUNITION SUPPLY.

47. From Recesses. (Normal Method.)

Cartridge recesses are on the emplacement floor. The cartridges are removed from their cylinders by 6 and 8, who hand them up bare to 3 and 5 on the gun floor.

Projectile recesses are on the emplacement floor. Projectiles are kept unfuzed in peace time, but on hostilities becoming imminent, and during hostilities, the recesses are kept filled with fuzed shell.

7 and 9 lift projectiles on to the gun floor for 3 and 5. With *H.E. shell* 7 and 9 unpin before placing them on the gun

floor, 3 and 5 uncap. Fuze caps should be thrown into a bucket or other receptacle to prevent their littering up the gun floor.

From Depots.

Cartridge and projectile depots are arranged in the most sheltered places on the level of the emplacement floors. Supply from depots is similar to that from recesses.

NOTE.—*The above forms of supply must be made intelligently, as the gun is traversed, from the most convenient recess or depot.*

Lift Supply from Magazines and Shell Stores.

7 and 9 go below, and, with six additional numbers (ammunition detail), supply and work the lifts.

Cartridges are sent up by lift in their cylinders (lids removed) to the emplacement floor, 6 and 8 hand them up bare to 3 and 5.

Projectiles are sent up to the gun floor cleaned, fuze, and with grummets removed; 3 and 5 pick them up and load alternately. With *H.E. shell* 3 and 5 unpin and uncap before picking them up. Caps as at recess supply, should be thrown into a bucket or other receptacle.

Empty cartridge cylinders are removed and stacked during any pauses in the firing.

NOTE.—*At the commencement of an action if a rapid rate of fire is not required, it may be desirable to use lift supply when the men are fresh and no casualties have occurred. This reserves the supply in recesses and depots till a later period, when fire will be more rapid, casualties may have occurred, and men have begun to tire.*

CHAPTER V.

LAYING TESTS.

48. INTRODUCTORY.

The rules for laying, the syllabus for training of gun layers, and the general instructions for carrying out the examination in gun laying are laid down in "Coast Artillery Training," Vol. I.

The tests and the method of carrying them out are as follows:—

49. SYLLABUS FOR EXAMINATION IN GUN LAYING.

In order to qualify, 75 per. cent. of the total marks must be obtained with not less than 60 per cent. in any one test.

<i>Tests.</i>	<i>Total marks.</i>
I. <i>General knowledge—</i>	
i. Clinometer. Use, setting, reading and use of calibration scale.	
ii. Telescope. Focussing, testing for parallax, and collimation.	
iii. Rocking bar sight. Testing and adjusting; setting M.V., and charge temperature corrections on reader of Mk. II.	
iv. Training arc. Use; testing adjustment of pointer.	

<i>Tests.</i>	<i>Total marks.</i>
I. <i>General knowledge—continued.</i>	
v. Auto-sights. Names and uses of various parts; testing and adjustment; datuming; testing for line with adjustments.	
vi. Primers and tubes. Identification and description; Continuity tests ...	35
II. <i>Means for firing.</i>	
i. Strikers. Removing, stripping, adjusting and replacing; gauging protrusion.	
ii. Rifle mechanism. Fitting and adjusting.	
iii. Breech mechanism. Assembling (For i, ii, and iii, 10 marks).	
iv. Electric apparatus—	
(a) Description and testing of cells; faults and their remedies; use of voltameter and I.T.P.B.; fitting up and testing lighting circuits ...	(15 marks)
(b) Battery box, circuit, and pistol grip; overhauling, connecting up, and testing ...	(15 marks) 40
III. <i>Laying for line—</i>	
i. Telescopic sights. Two sets of sights will be used. The layer, using one set, will keep the gun laid for line on a moving target for one minute. The officer, by means of the other set of sight, will check the laying five times during this minute. When	

<i>Tests.</i>		<i>Total marks.</i>
III.	<i>Laying for line—continued.</i>	
	checked, the line must be within $2\frac{1}{2}$ minutes of the correct line, otherwise no marks will be scored for that occasion ... (5 marks)	
	ii. Open sights. As above ... (5 marks)	
	iii. Training arc. Trainings will be called out by the setter for line to represent the uniform movement of a target. The layer will keep the gun laid by means of the training arc for one minute, moving the gun evenly between the graduations on the arc at approximately the rate of change of training. The officer will check the laying five times during this minute.	
	When checked, the laying must be within $\frac{1}{8}^{\circ}$ of the correct training.	
	(10 marks)	20
IV.	<i>Laying for elevation—</i>	
	Elevation indicator. Ranges will be called by the setter for range, mechanical and electrical dials being used; the ranges will be those at which the Q.E. corresponds to a range of 7,000 yards, or thereabout, for medium guns with full charge, and 9,000 yards, or thereabout, for heavy guns with full charge.	

*Tests.*IV. *Laying for elevation—continued.**Total
marks.*

The gun should be balanced as for firing.

A layer will be stationed at the pistol grip to call "Fire," or to ring a bell (inserted in the circuit) at the word "On" from the layer under test. The officer will order "Pass ranges." After five or six ranges have been called, the officer will order "Gun fire—Fire."

A number stationed at the breech will then give "Ready," and the layer under test will call "On" when the gun is laid.

"Ready" will subsequently be called at intervals corresponding to the rate of fire of the gun used.

The above procedure will be carried out five times with a shortening range, and five times with a lengthening range. With the shortening range, the average of the times from "Ready" to "On" must not exceed 4 seconds, and with the lengthening range must not exceed 6 seconds. The gun must be depressed each time through at least 300 yards, and must be accurately laid to within 10 yards, the layer allowing for the rate of change of range.

<i>Tests.</i>		<i>Total marks.</i>
IV.	<i>Laying for elevation—continued.</i> The rate of change of range should not be slower than 50 yards in 20 seconds. If the layer elevates before the layer for line has fired or has called "Fired," no marks will be scored for that round. With guns fitted with brakes, if the layer fail to apply the brakes before calling "On" no marks will be scored for that round.	30
V.	<i>Rocking bar sights—</i> Each competitor will set the range drum to the range indicated on the electric dial, five times with range decreasing, and five times with range increasing. One mark to be deducted for each error in setting, or for failure to take up any backlash in the sight.	10
VI.	<i>Auto-sights—</i> i. Target. A well-defined stationary target in the water will be chosen. If none be available, an anchored target will be used. The range must be long enough for the ratio of movement of gun and sight to be more than 3 to 1, but reduced charge or aiming rifle cams may be used. ii. Laying. Telescopes should be used. When testing trained layers, each	

*Tests.**Total
marks.*VI. *Auto-Sights*—continued.

will lay once slowly and carefully on the water-line of the target, and the mean of these lays will be taken as the "standard lay." In the case of classes under instruction, the "standard lay" will be determined by the instructor. When qualifying gun layers, if there be a rapid variation in rise and fall of tide, candidates should be tested in small groups at a time, and a rise (or fall) of tide diagram be kept in order to ascertain the true standard lay for each competitor. Where possible, tests should be carried out at slack water.

Each competitor will lay five times on the water-line of the target. Before each lay the gun will be traversed, so that the target is clear of the field of the telescope, and the gun will be elevated above the target before three of these lays, and depressed before the other two, two or more turns of the handle being given in each case, in addition to any turns required to absorb backlash in the elevating gear.

The officer will order "Lay."
The competitor will then lay, call

<i>Tests.</i>	<i>Total marks.</i>
VI. <i>Auto-Sights</i> —continued.	
“Fired,” and step clear. The interval between “Lay” and “Fired” will be measured each time. During two of these intervals deflection will be changed by the layer, according to directions given by the officer before the order “Lay.”	
iii. Checking the laying. The officer will note if each lay be within $2\frac{1}{2}$ minutes for line. A clinometer will be kept on the gun, and the Q.E., after each lay, will be carefully read and noted, but the gun layer should not be told the result of any lay until he has finished. The sum of these lays divided by the number of them is the mean lay. The difference between each lay and the mean will then be taken, and the sum of these differences, irrespective of sign, divided by the number of lays, is the <i>layer's mean error along the gun</i> .	
With every auto-sight a “Table of Angles” is issued, showing corresponding angles of Q.E. and of sight. If two angles of Q.E. be chosen, one on each side of the Q.Es. of the gun during the test, and the difference between them be taken; and also	

*Tests.*VI. *Auto-sights*—continued.*Total marks.*

the difference between the corresponding angles of sight, then the ratio which the difference in Q.E. bears to the difference in angle of sight may be taken as the ratio of movement at the range, or the ratio of movement may be ascertained as described in Sec. 57.

If the layer's mean error be divided by the figure expressing this ratio, the result will be the *layer's mean error along the sight*.

The difference in Q.E. between the layer's mean lay and the standard lay, divided by the ratio of movement, will give the layer's difference from the standard lay along the sight.

- iv. Qualifying. To qualify, every lay must be within $2\frac{1}{2}$ minutes of the proper line. The layer's mean error along the sight must be less than 0.4 minute, and his mean lay along the sight must be within 0.4 minute of the standard lay. The total of the times taken for five lays must not exceed one minute for 6-inch guns and upwards, nor 45 seconds for guns of less calibre.

Tests. VI. *Auto-Sights*—continued. *Total marks.*

v. Record. The lays should be plotted on a diagram; each layer's proficiency can then be seen.

vi. System of marking. 10 marks for consistency, 10 for accuracy, and 10 for time.

Consistency—

Layer's errors in minutes along line of sight—

					Marks.
0	...	...	...	...	10
0.1	...	...	...	...	9
0.2	...	...	...	...	8
0.3	...	...	...	...	7
0.4	...	...	...	...	6

Accuracy—

Layer's difference in minutes from standard lay along line of sight—

					Marks.
0	...	...	...	...	10
0.1	...	...	...	...	9
0.2	...	...	...	...	8
0.3	...	...	...	...	7
0.4	...	...	...	...	6

Full marks will be given for time, if the limits laid down in (iv) above be not exceeded, otherwise no marks will be given, and the candidate will fail to qualify ... 30

<i>Tests.</i>		<i>Total marks.</i>
VII.	<i>Dials—</i>	
	Preparation for action; connecting up electric dials; reading electric range and training dials; applying corrections, section difference, and concentration on movable faces of dials; synchronizing electric dials in preparation for change to Case III; applying deflection to training pointer, and corrections to drift and concentration scale; reading range and training indicator dials	15
	(NOTE.— <i>The examiner will pay particular attention to details of drill, and to clearness in calling ranges.</i>)	
VIII.	<i>Drill—</i>	
	Preparation for action with guns at the station; duties when changing from one method of laying to another; passing, repeating, and applying corrections and deflections; duties of layers and setters in a Q.F. group; blind setting; distribution of fire scheme	20
	Grand total	200

CHAPTER VI.

CARE AND ADJUSTMENT OF LAYING GEAR.

50. CLINOMETERS.

Instructions regarding the care, tests and adjustment of clinometers are laid down in "Coast Artillery Training, Vol. I, 1921."

Clinometers must always be tested before being used.

51. CARE OF SIGHTS AND TELESCOPES.

1. Sights should be kept clean, oiled, and free from grit. They should on no account be polished.

2. When not in actual use, the telescope, the sight bar, and other fittings attached, should be removed when circumstances permit and placed in a dry store. The removal of the sight bar can be effected by removing a nut and washer, which will be found under the pivot.

3. With the auto-sight, the efficiency of the sight depends upon the accuracy of the cam and roller. Special care must be taken that they receive no damage. They must on no account be polished, but be kept clean and free from grit and dust, by wiping with a clean rag moistened with a few drops of oil.

4. All parts are to be kept clean, working parts well lubricated with clean oil, and (with the exception of the cam groove and roller) lightly smeared with anti-corrosive grease when not in use. Bath brick, emery, or other abrasive substance must not on any account be used for cleaning.

5. The sight gear should not be taken apart unnecessarily, and adjustment should not be made by scraping or filing except on special authority.

6. The exterior surfaces of telescopes are to be cleaned with a soft rag and paraffin only. The exterior surfaces of lenses should be cleaned with a piece of chamois leather, which must be kept perfectly clean and dry, and used for this purpose only.

7. The bearing surfaces of sighting telescopes must be very carefully protected. Any burrs or dents on these surfaces throw the telescope out of adjustment.

8. Telescopes must not be taken to pieces, nor the lenses removed, nor adjustment for collimation attempted, except by a competent person. When not in use they should be closed up, caps replaced, and placed in their cases. They should be kept in as dry a place as possible.

52. TEST FOR BEND IN Y BRACKETS.

In some cases the brackets in which a telescope rests become bent, and it may then be found that the telescope alters position when its brackets are clamped or unclamped.

In this case the sight should first be laid, with the brackets unclamped, on a fixed mark. Remove the telescope, place in the "bar, testing sights," and take the depression angle of sight by clinometer.

Then clamp the brackets and note whether the clinometer bubble remains central. If it does not, bring it central by the error-of-day drum and note the reading. Then remove the bar, testing sights, move the error-of-day drum back to zero, replace the telescope, and clamp the brackets.

If the pointer is not on the fixed mark, bring it on by means of the error-of-day drum and note the reading. If the readings are alike no compensation is needed. If the readings are different an adjustment of the eccentric connected with the error-of-day drum is required, the drum being set at the reading as found when using the bar, testing sights, and the telescope pointer being brought on to the object by means of the Q eccentric.

In clamping up the Y brackets care should be taken to tighten the clamps simultaneously, since, if tightened separately, variations in readings will occur according to which clamp is bent.

53. TESTS FOR SIGHTING TELESCOPES.

1. Telescopes of recent manufacture are focussed for individual eyesight by revolving the eyepiece until the pointer is clearly defined. Since with these telescopes, changes in focal distance due to change of range are inappreciable, no means of focussing the object glass are provided. The pointer is placed at the focal distance of the object glass, and both it and the distant view should become clear at the same time. An inverted image of the distant view is formed at the focal distance of the object glass.

2. To test if the pointer is at the proper distance from the object glass, focus it with the eyepiece, and then lay so that a very small bright space is left between the tip of the pointer and some distant object; now move the eye behind the eyepiece, and note if the bright space vanish or change size. If it does either, the adjustment of the pointer is incorrect. An inaccuracy, called *parallax*, will then be caused by changing the position of the eye, and, since both pointer and distant

view can no longer be focussed together, the eye will be strained and will tire rapidly. Telescopes found wrong in this particular should be sent for adjustment to the instructor in gunnery.

3. Telescopes are issued, and should as a rule remain correctly collimated. To test for collimation, the telescope is placed in its holders, focussed and then directed on a well defined object not less than 400 yards distant. When the telescope is turned round in its brackets, the tip of the pointer should not move off the point laid on. Care should be taken that, in carrying out this test, movements of the gun are not mistaken for movements of the pointer. Telescopes found incorrect for collimation must be adjusted by a properly qualified person. In some cases the brackets in which telescopes rest become bent, and it may then be found that the telescope alters position when its brackets are clamped or unclamped. For procedure in the case of rocking bar sights and auto-sights respectively, *see* Secs. 54 and 55.

54. TEST AND ADJUSTMENT OF ROCKING BAR SIGHTS.

1. Lay the gun horizontal by means of a clinometer, place the bar, testing sights, in the Y brackets, bringing the marks on it and on the bracket to coincide so as to obtain correct cross level; bring the rocking bar to angles of depression corresponding to the tangent elevations for various ranges corrected for the height of the telescope above the axis of the gun, and for refraction, by working the hand wheel, and see if these ranges correspond with those on the sight drum. If they do not correspond, slacken the screws on the outer circumference of the range drum, and turn the scale until

the correct range is read, afterwards tightening the securing screws.

2. The sight may be datumed at M.S.L. on a datum post by giving the requisite Q.E. to the gun by clinometer, and turning the range drum of the sight till the telescope pointer is on the water-line of the datum. The range drum should then read the true range to the datum. If it does not, adjust as in para. 1. This is the most satisfactory adjustment in the case of bent telescope brackets.

3. To test for deflection, lay the gun on a distant mark, obtaining a line of sight through the axial vent (or firing hole bush) and the intersection of two fine cords stretched on the axis lines on the muzzle. The sight, with elevation and deflection set at zero, should be on the same mark. If it is not, bring the sight on to the mark with the deflection gear and adjust the reader of the deflection scale to zero.

55. GENERAL INSTRUCTIONS FOR TESTING AND ADJUSTING AUTO-SIGHTS.

1. The auto-sights of all guns will be tested annually by an inspector of ordnance machinery or by an officer deputed specially for that purpose by the Superintendent, Ordnance Factories. The tests will be such as are prescribed for the original setting up of the sight, and, if necessary, the sight and cam will be re-set.

A test will be made of all cams, whether for full or reduced charges, or for aiming rifles.

2. Verticality of pivot and truth of correctional gear will be tested and, if necessary, adjusted, at the same time by the same officer.

A certificate from this officer that he has personally set up the sight, and that it is in correct adjustment, will be furnished to the garrison commander. An entry showing date, and by whom tested, will be made on a form provided for the purpose.

These tests should be carried out before the first series in the annual practice is fired from the gun.

3. If the sights cannot be set up true for all ranges up to the extreme limit of range, and the cam cannot conveniently be returned to be trued at the Arsenal, the I.O.M. will furnish a table showing the errors at each angle on the Woolwich table of angles. This table will be filed with the Woolwich table of angles. In the case of guns used solely for anti-torpedo-craft defence the limit of range will depend on the extent of the illuminated area.

4. After testing, the eccentrics on the carrier will be painted over and will on no account be tampered with, except by an I.O.M. or R.G.C.F. artificer.

With the above tests and adjustments, the responsibility of the I.O.M. or the Royal Gun and Carriage Factory with regard to the sights ceases, except as regards sights which may again require to be set up during the year.

5. Officers in charge of guns are responsible for the care and preservation of the sights, and for such tests and adjustments as can be carried out without the assistance of a skilled artificer.

All officers should be able to carry out such tests, and such adjustments as do not require the assistance of artificers. The eccentric bush Q is the only eccentric which may be moved without the assistance of an artificer.

6. Clinometers, large, should be used for adjusting auto-sights. It is very important that these should be in perfect adjustment and be provided with calibration sheets (see "Coast Artillery Training, Vol. I.," Sec. 116, 10. When placing the bar, testing sights, in the telescope brackets, the marks on it and on the brackets should coincide, thus ensuring correct cross level.

7. The gun must be balanced as if loaded, and must always be brought into position by a large sweep of depression (except in the case of those guns with which the last motion should be one of elevation); the latter rule must also be observed when firing.

In the case of a mounting with sighting steps, it must be balanced by keeping men in the positions of the layers and setter during the test.

8. When setting the error-of-day drum, both for testing and putting on corrections, the last movement given should be one of "add."

When setting the tide-lever the last movement should be in the direction of "fall."

9. Cams will be changed as seldom as possible. This operation may be performed under the supervision of the S.C. Guns should, however, usually be fitted with the full charge cam, and in any case a full charge cam must be fitted and tested annually.

Whenever a change is made from one cam to another, and always in preparing for action, the sights will be carefully tested and adjusted by the layers under the supervision of the S.C.

Unnecessary adjustments of eccentrics should be carefully avoided.

56. TEST FOR VERTICALITY OF PIVOT WITH AUTO-SIGHTS.

1. With guns of which the sights cannot be corrected for want of level independently of the rest of the mounting:—

Place clinometer on gun and bring bubble central.

Traverse through 180° , halting every 30° . The bubble should return to the same position each time the gun is halted. The training of maximum tilt and the amount the pivot is out of the vertical can be determined by this test.

2. Means are provided with certain guns for correcting the sight independently of the rest of the mounting. With guns thus fitted, the bubble of the spirit level on the cam should come to the same spot, no matter in what position the gun be halted.

An alternative test is to place a clinometer on a bar, testing sights, in the telescope brackets and traverse through 180° , halting every 30° . The gun should be brought horizontal each time, and the angle of depression of the sight should then always be the same. If rapidity be necessary, and the pivot only slightly out of truth, this test may be modified by giving the gun extreme elevation; small movements of the gun, due to want of level, would have then an inappreciable effect on the sight, and the elevation of the gun need not be attended to during the test.

3. Adjustments for verticality of pivot require the services of an artificer.

57. MECHANICAL TEST WITH AUTO-SIGHTS.

1. If it be necessary to use auto-sights before the mounting can be restored to level, this test should be carried out in the middle of the arc of fire.

2. Set the error-of-day drum and deflection scale at zero and tide-lever at mean sea level, and clamp the bar, testing sights, in the telescope brackets; also, with a combined sight, throw the catch into the fork. From the Woolwich table of angles, supplied with each auto-sight, select a suitable range; bring the gun to the corresponding Q.E.; the angle of depression of the sight should now be the one corresponding to this range. For guns used at night the range selected should be as near the "test range" as possible.

3. The test range for guns used at night is the range when the attack develops. This is the range to the leading vessel at the time it has just entered the illuminated area, or, in the case of guns provided with fighting lights, when first adequately illuminated by such lights.

The test range must not be beyond the accuracy limit of the auto-sight.

4. If the depression angle is not correct, it must be made so by turning the eccentric connected to the error-of-day drum, after first slacking its clamping nut, or by turning the error-of-day drum and noting the reading, which will be taken as the zero for subsequent settings. In some cases this adjustment is carried out by turning the error-of-day drum, after which the movable skin is adjusted to read zero.

The sight should then be set to extreme deflection each way in turn, and the bubble of the clinometer should not move. If it does, the services of an artificer are necessary.

5. If time is available, this test may be repeated for every range in the table of angles; if, after adjusting the sight for one of these ranges, the remaining readings are incorrect, the eccentrics on the carrier require adjustment; for this the services of an artificer are necessary.

For guns used at night these tests will be carried out at ranges on each side of the test range; the sight may be considered correct provided that no test within 500-yards of the test range shows an error greater than that corresponding to one minute of Q.E. The permissible error in the depression angle

of the sight will therefore be $\frac{a}{a+\theta}$ minutes. (See "Coast Artillery Training, Vol. I., 1921," Sec. 215.)

6. In carrying out this test, where local conditions make it certain that the variation in range during action with auto-sights will be small, the quadrant angles shown in the Woolwich table of angles should first be corrected for the variation in M.V. of the gun from the normal M.V. for which the cam was cut.

Such cases are :—

- i. Guns mounted on low sites, when the effective limit of auto-sights is under 3,000 yards.
- ii. Guns used for the defence of narrow channels, the shape of which makes big variations in range impossible.
- iii. Guns used at night, when the range of the guns is limited by that of the lights.
- iv. Anti-torpedo-craft guns.

When this method is employed, the range selected for the test must be approximately the same as the test range.

It must be clearly understood that the alteration of the Woolwich table of angles makes the sight inaccurate at all ranges other than those near the test range, and that, therefore, this method must be strictly limited to guns which will use the auto-sight under only the conditions given above.

58. TEST OF ZERO OF DEFLECTION SCALE OF AUTO-SIGHTS.

1. In the case of guns fitted with rocking bar sights and auto-sights, the former is tested for line as described in Sec. 48, and the latter is then checked against it by laying with the auto-sight on a distinct mark on the water. If the deflection scales of the two sights do not now read alike, that of the auto-sight must be made to agree with that of the rocking bar sight.

2. When guns have auto-sights only, the sight must be tested with the bore of the gun, but the mark must be near enough to allow both gun and sight to be laid on it for a line and to eliminate most of the drift correction which is automatically applied on the sight.

59. TO DATUM THE AUTO-SIGHT.

1. It is desirable to have a false datum mark to which the angle of depression is the same as that of the test range at mean sea level.

A false datum mark is generally preferable to a water-line datum when datuming auto-sights, as the operation can then be carried out for mean sea level at all states of tide; also inaccuracies due to waves are eliminated.

Such a mark should not be less than 400 yards from the gun, since the telescope would then be out for parallax.

Failing this, a natural mark should be selected at a range as near the test range as possible.

2. From the datum slide rule or table of Q.Es. ascertain the Q.E. necessary for calibration M.V., allowing for wear of gun

since calibration, charge temperature, and, if necessary, for rise or fall of tide, and for raising M.P.I.

All breech fittings should be on, shell and cartridge in the bore, and, with 6-inch guns, all layers and setters on the sighting steps; thus balancing the gun exactly as for firing.

Set the tide-lever, test the clinometer for index error, and then lay the gun at the required Q.E., taking care that the last motion is one of depression.

If the tip of the pointer is now found to be very nearly on the datum mark, it should be brought exactly on by means of the error-of-day drum or clicking indicator, taking care that the last motion is one of "add."

If it is not very nearly on, slack off the locking nut of the eccentric bush Q, raise the pointer well above the datum mark by turning the eccentric bush Q, and then bring it down nearly as far as the mark; tightening up the locking nut will give the pointer a further motion of depression, but only constant practice will train a layer to judge the final amount of depression obtained by tightening up the locking nut.

3. After adjusting the sight, the layer must lay the gun at least three times by the auto-sight. If the bubble of the clinometer, set to the required Q.E., comes central each time, the sight is satisfactorily datumed.

If the bubble does not come central each time, adjust on the error-of-day drum or clicking indicator, and again try the three lays.

Not till three consecutive lays are correct can the sight be said to be properly datumed.

4. In datuming, errors of collimation are automatically corrected. Once the sight has been datumed, the telescope must on no account be shifted in the Y brackets; if it is

moved at all, a considerable error may be introduced, due to worn Y brackets, worn telescope bearings, or both.

5. *To determine the position for the false datum mark.*—Calculate the depression angle for the test range (see Sec. 57), taking into consideration the height of the axis of the telescope above the trunnions, and the necessary correction for curvature and refraction. See that the pivot of the mounting is vertical, and that the telescope is in correct adjustment for collimation and parallax. Set the sight to the above depression angle, traverse on to some object, and paint a mark thereon in line with the pointer of the telescope. If no natural object is available a post should be erected.

A convenient mark may be used, should one exist approximately in line with the pointer of the telescope, but in this case the range corresponding to the depression angle to this mark must be calculated (see "Coast Artillery Training, Vol. I, 1921," Sec. 221).

In selecting a position for a false datum care should be taken that there is no ground, such as sand, &c., between the gun and the mark, which might cause variations in refraction.

60. TEST FOR BACKLASH.

1. The sight should occasionally be tested by bringing it to a certain angle, first by a wide sweep of depression, and then by a wide sweep of elevation, and noting the difference between the readings of the clinometer on the gun on each occasion. This should be done at angles corresponding to three or more widely different ranges.

2. When a considerable discrepancy is found between readings, the sight requires overhauling. This will most

frequently occur with combined sights. These sights require testing, both as auto-sights and rocking bar sights.

**61. TESTS, &c., FOR VERTICALITY OF PIVOT
WITH ELEVATION INDICATOR.**

1. Verticality of pivot should be tested as in Sec. 56, 1.
 2. Since the elevation indicator indicates the elevation of the gun relatively to the mounting, it follows that any inclination of the latter will cause an equal angular error in quadrant elevation. The error will be — or + according as the tilt of the mounting is to the front or rear.
 3. The proper correction can be applied at any one training as follows:—Lay the gun by clinometer at the Q.E. for a selected range, and adjust the elevation indicator to read the proper range. This adjustment should be made at the training where there is no tilt, or at what is considered the most important training in the arc of fire as decided locally, and the elevation indicator should always be tested at the same training.
 4. For further consideration of the effect of tilt and corrections required, see "Coast Artillery Training, Vol. I., 1921," Sec. 207.
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CHAPTER VII.

CARE OF EQUIPMENT.

62. GUNS.

1. Guns will, for storage and transport, be greased internally with "composition preserving," and blocked with painted dry wood blocks, the joints being made tight with putty. This operation should be carried out if possible in dry weather. The exterior of the piece, including clinometer plane and all bright parts, will be painted. Guns will be unblocked for examination every 12 months.

The bright parts of guns will be oiled and if not in frequent use will be covered with red mineral jelly. The bores will be kept cleaned and oiled.

2. Before firing, the "composition preserving" or oil will be removed.

After firing powder the bore will be washed and, as soon as dry, will be oiled with a greasy cloth or piece of old linen tied over the piasaba brush.

After firing with cordite charges the bore will be thoroughly washed out, and, when dry, coated with red mineral jelly.

After using an aiming rifle in a gun, the bore of the latter will be thoroughly cleaned as soon as possible after the aiming rifle practice and before service ammunition is fired from the gun.

3. Guns will be depressed to prevent rain or moisture lodging inside, the muzzle and breech ends being protected by covers.

4. When guns have to be kept loaded, bores are not to be lubricated or wiped out from the muzzle as a ring of lubricant may be left at the extreme point reached and this may cause a premature.

Guns are to be unloaded once a month, so that bores may be cleaned and prevented from rusting.

5. Clinometer planes must not be cleaned with any abrasive material.

6. As a general rule all B.L. and Q.F. guns under 6 inch calibre, when mounted in exposed positions and not in frequent use, will have all fittings removed.

Fittings will be kept in store, the steel portions being covered with mineral jelly.

Fittings remaining with the guns will be treated in a similar manner.

In the case of guns used for drill and practice all fittings must be kept free from dust and grit and all working parts well lubricated.

63. MOUNTINGS.

1. When mountings are being overhauled, all parts of a portable nature which are not required for the immediate continuation of the work should be placed in the artillery store, or other suitable place, for safe custody.

2. A thorough cleaning and lubricating of all working parts must take place at least once a month. All grease must be removed, if necessary by scraping, the parts being wiped clean and then freshly greased. In the case of mountings which are much exposed and liable to accumulate dust or sand, the parts should not be left with much grease or oil upon them, but only

sufficient to cover the parts. As a thin film serves as protection for only a short time, the parts of such mountings must so much the more often be cleaned and freshly oiled. Special care must be taken to prevent grit from accumulating on the cradle grooves and gun slides or other sliding surfaces.

Friction clutches, and brake drums should be kept clean, smooth and slightly oiled to prevent seizing.

Ball bearings, rollers and races must be kept well lubricated.

3. When lubricating, the lubricating holes should be cleaned out with a wire and then filled with oil. Care must be taken to replace the screws of lubricating holes; the heads of the screws must be kept bright, so as to be readily seen.

After filling the oil holes, and whenever fresh lubricant has been applied, the parts should be well worked backwards and forwards so as to distribute the lubricant.

Traversing gears, if not working freely, should be examined particularly as regards the ball bearings or rollers. Any broken balls should be replaced at once, and any burrs on rollers or roller paths removed.

Holding down clips and clip rings should be attended to occasionally to ensure that they do not affect the traversing and that they are in good order.

Brake gears should be regulated by means of the adjusting screws until the tension of the brake band is just sufficient to do the work required.

Friction plates should be tightened up by means of the adjusting nuts, sufficiently to allow of a slight slip in the gear on firing. All teeth of arcs should be free from burrs.

When adjusting the trunnion bearings of a heavy mounting, the adjusting screws should be screwed up gradually and evenly on either side until the elevating gear can be worked

freely by one man, care being taken that the adjusting screws are not screwed up too far, and that they are secured by their set screws.

When not in use, all bearing screws should be slackened.

4. Buffers must be kept filled and in good working order. Buffers should be carefully examined before firing or drill in order to ensure that the cylinders contain the requisite quantity of liquid as shown on the inscription plate ; that there is not leakage at the glands ; and that the piston rods are properly connected.

All spare leather packings should be kept in store and occasionally rubbed with dubbin in order to prevent them from becoming hard and brittle. The supply of spare packings should never be allowed to run low.

It is most important that grit and dust should be prevented from entering hydraulic cylinders. After drill or firing, a well-oiled twist of tow should be bound lightly round the ram close to the gland of the cylinder and left there till next time of working, when it should be carefully removed so as to clear away any collection of dust. Any grit or dust found on the ram during firing should at once be removed.

5. Electric firing gears and leads should be carefully cleaned periodically at the joints.

Particular care should be observed, when removing or adjusting any parts or gears, not to indent or damage parts by rough usage. An iron hammer should never be used unless with a piece of wood or brass to transmit the blow.

6. Nuts and screws should be slightly oiled before being applied or inserted, and a few turns given by hand before using a spanner. A hammer should never be used to tighten screws or nuts.

7. The points of split pins, which have been replaced, should be well splayed out.

CHAPTER VIII.

DISABLEMENT OF ORDNANCE.

64. GENERAL INSTRUCTIONS.

The various methods by which ordnance may be disabled must be considered under three heads, according to circumstances, and are as follows—

i. *Temporary disablement.*

(a) By removing essential stores, such as :—

Breech screw.
Sighting gear.

(b) By putting buffers out of action :—

Release air pressure.
Remove plugs and buffer nuts.
Empty buffer.

(c) By damaging breech mechanism :—

Damage mechanism or screw threads with a crowbar or heavy hammer.

NOTE.—When there is a probability that the gun will shortly be regained, disablement should be confined to the removal of essential fittings and stores.

ii. *Complete disablement.* (In cases of emergency only.)

Dent the spring cases with a pickaxe, &c.

Remove plugs and buffer nuts.

Empty buffer.

Lay the gun horizontal.

Place an obstruction in the bore. (*See* ii. (a) below.)

Load with a round of H.E. (and in addition place in the chamber the greatest possible amount of explosive such as guncotton, or any high explosive that may be available). (*See* ii. (b) below.)

Fire the gun from under cover; electrically, if possible; if not, by means of a long lanyard.

(a) If shell are fuze with D.A. or D.A. impact fuze an obstruction placed in the bore capable of striking the fuze or another shell placed in the muzzle will suffice.

iii. *Permanent destruction.*—If time permits and material is available, this can be effected best by means of guncotton, as follows :—

(a) A shell having been loaded in the ordinary way, the necessary charge is packed in behind it, so as to be in close contact with the shell and with the sides of the chamber.

(b) The primer is next inserted in the guncotton slab.

(c) Sods, earth, or other material, are then used to keep the guncotton in position.

(d) The detonator, with the safety fuze or electric leads attached, is placed in the primer.

- (e) The breech block is swung to as far as the safety fuze or electric leads will allow.
- (f) The charge is then fired from under cover.

65. CHARGES, DETONATORS, AND FUZE.

1. The charge required (see Sec. 64, iii (a)), is as follows :—
For a 6-in. B.L. gun use 16 lbs.

It is not absolutely necessary to use a shell, but the effect of the explosion is thereby increased.

Other high explosives may be used instead of guncotton, but in some cases special precautions have to be taken e.g., dynamite is often frozen, and must be carefully and slowly thawed before being used. This should be done in "pan warming dynamite"; if such be not available the dynamite should be placed in a watertight tin and surrounded by warm water until thawed.

2. Guncotton slabs are 6 inches by 3 inches by $1\frac{1}{8}$ inches, with one perforation for the primer. Weight of slab, 15 ounces. Slabs are wet. Guncotton primers are 1.35 inches to 1.15 inches in diameter to fit the perforation in the slab and have one perforation for the detonator. Weight of primer, 1 ounce. Primers are dry.

It is difficult to detonate wet guncotton by itself. A primer is easily detonated. To detonate a charge of wet guncotton a primer is put in close contact with the wet slabs, the primer is detonated, and this causes the wet guncotton to detonate also.

3. There are two kinds of detonators in the service for detonating guncotton :—

- (i.) Detonator No. 8 for safety fuze.
- (ii.) Detonator No. 13 for use with electrical firing apparatus.

The No. 8 detonator (Mark VII) consists of a solid drawn copper tube containing 30·8 grains of fulminate of mercury composition.

The exterior of the body is painted red, and a small label bearing the number and numeral of the detonator is attached.

Safety fuze is painted black and carried in tin cylinders, and will burn under water. The usual rate of burning is 3 to 4 ft. a minute, but if it has been kept in store long, especially in a tropical climate, it may burn much quicker, therefore a piece should be tested.

66. TO PREPARE A CHARGE.

1. To prepare a charge to be fired by No. 8 detonator :—
 - i. See that the guncotton slabs are in close contact with each other, and that the primer is properly inserted in and touching a slab.
 - ii. Take a piece of safety fuze of such length that the man lighting it will have time to get to a safe distance before the charge is detonated. Cut one end square and the other on the slant.
 - iii. Insert the square end of the safety fuze into the detonator, taking care not to press it down too far on to the composition; do not hold the detonator by the end containing the fulminate. Then

crimp the end of the detonator case on to the safety fuze with the crimping pliers if available, if not any pliers will do; sufficient force should only be applied to cause the detonator to grip the fuze.

- iv. Rectify the hole in the primer and insert the detonator carefully into it.
- v. Light the slanting end of the fuze. A fuze or port fire is more convenient than an ordinary match.

NOTE.—No. 8 detonators are also issued with 2 feet of safety fuze attached.

67. TO FIRE A CHARGE.

1. To fire a charge electrically, the primer and slabs are arranged as already described. The No. 13 detonator is connected to the leads and is then inserted in the primer, and is fired by a "F.S. Exploder." Care must be taken that the other ends of the leads are not attached to the exploder till everything is ready for firing.

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